THE ANNALS OF APPLIED BIOLOGY

EDITED BY

R. W. MARSH

AND

I. THOMAS

WITH THE ASSISTANCE OF

F. C. BAWDEN J. T. MARTIN

M. J. R. HEALY E. A. PARKIN

D. J. WATSON

VOLUME 51

CAMBRIDGE

AT THE UNIVERSITY PRESS

1963

PUBLISHED BY
THE SYNDICS OF THE CAMBRIDGE UNIVERSITY PRESS

Bentley House, 200 Euston Road, London, N.W. 1
American Branch: 32 East 57th Street, New York 22, N.Y.

Printed in Great Britain at the University Press, Cambridge
(*Brooke Crutchley, University Printer*)

CONTENTS

No. 1 (February 1963)

PAGE

1. Studies on parsnip canker. I. The causes of the diseases. By A. G. Channon. (With Plates 1 and 2) 1

2. Potato haulm resistance to *Phytophthora infestans*. IV. Laboratory and field estimates compared, and further field analyses. By D. H. Lapwood. (With 5 Text-figures) 17

3. 'Eyespot', a foliar disease of bananas caused by *Drechslera gigantea* (Heald & Wolf) Ito. I. Preliminary studies on pathogenicity and spore dispersal. By D. S. Meredith. (With Plate and 5 Text-figures) 29

4. Experiments on the use of ethyl mercury phosphate and other materials for treating sugar-beet seed. By W. J. Byford 41

5. Greenhouse evaluation of chemicals for control of powdery mildews. I. A method suitable for apple and barley. By A. H. M. Kirby and E. L. Frick. (With 2 Text-figures) 51

6. Greenhouse evaluation of chemicals for control of powdery mildews. II. Some factors affecting artificial infection of apple foliage. By A. H. M. Kirby and E. L. Frick. (With 4 Text-figures) 61

7. Further studies of green petal and other leafhopper-transmitted viruses infecting strawberry and clover. By A. F. Posnette and Christina E. Ellenberger. (With Plates 1 and 2) 69

8. Host range and properties of grapevine fanleaf and grapevine yellow mosaic viruses. By H. F. Dias. (With Plate) 85

9. The relationship between grapevine fanleaf, grapevine yellow mosaic and arabis mosaic viruses. By H. F. Dias and B. D. Harrison . . . 97

10. A comparison of competitive effects of some common weed species. By P. J. Welbank. (With 9 Text-figures) 107

11. The response of the feral pigeon when offered the active ingredients of commercial repellents in solution. By C. J. Duncan. (With 5 Text-figures) 127

12. Investigations on fungicides. VI. The antifungal activity of certain dithiocarbamic and hydroxydithioformic acid derivatives. By G. A. Carter, J. L. Garraway, D. M. Spencer and R. L. Wain 135

13. Investigations on fungicides. VII. The antifungal activity of certain hydroxy nitro alkanes and related compounds. By Angela N. Bates, D. M. Spencer and R. L. Wain 153

14. Studies on plant growth-regulating substances. XVII. S-esters of dithiocarbamates derived from amino acids. By K. Rothwell and R. L. Wain 161

PAGE

15. Proceedings of the Association of Applied Biologists:

Copper deficiency problems in south-east Scotland. By J. M. Ragg and D. Purves 169

Investigations of wind in the vicinity of shelterbelts and windbreaks. By J. M. Caborn 169

Some aspects of ringworm. By J. C. Gentles 170

Experimental moniliasis. By W. Blythe 170

Some observations on the infection of tomato stems by *Botrytis cinerea* Fr. By A. R. Wilson 171

The economics and chemical control of timothy flies (*Amaurosoma* spp.). By J. W. Newbold 171

Effect of lime and phosphate on soil Collembola. By S. B. Wakerley 171

Some ecological effects of temperature and cropping on population dynamics of *Heterodera rostochiensis* (Woll.). By E. Dunn . . 172

The life history, development and parasites of *Meligethes aeneus* (F.). By P. Osborne 172

Relation of weather conditions to insect activity and abundance in the Scottish Highlands. By C. B. Williams 173

Reviews 175

No. 2 (April 1963)

1. Teaching and research in plant pathology. (Barnes Memorial Lecture) By R. K. S. Wood 177

2. Eyespot (*Cercosporella herpotrichoides*) and other factors influencing yield of wheat in the six-course rotation experiment at Rothamsted (1930–60). By Mary D. Glynne. (With 4 Text-figures) 189

3. A method of isolating *Pythium* spp. and *Fusarium oxysporum* from soil. By E. W. Buxton and J. B. Kendrick, Jr. (With Plate and 3 Text-figures) 215

4. Studies on parsnip canker. II. Observations on the occurrence of *Itersonilia pastinacae* and related fungi on the leaves of parsnips and in the air within parsnip crops. By A. G. Channon. (With 1 Text-figure) . . 223

5. Reactions of tomato leaves to species of *Verticillium*. By D. A. Griffiths and Ivor Isaac 231

6. Withertip disease of limes (*Citrus aurantifolia*) in Zanzibar. I. Field trials with fungicides. By B. E. J. Wheeler. (With 6 Text-figures) . . 237

PAGE

7. Abacá mosaic virus and its relationship to sugar-cane mosaic. By A. L. Eloja and T. W. Tinsley. (With Plate) 253

8. The ameliorating effect of zinc on symptoms of phyllody virus (strawberry green-petal) in white clover. By A. J. H. Carr and J. L. Stoddart. (With Plate and 6 Text-figures) 259

9. Some new equipment for routine assessment of levels of soil infestation by the potato-root eelworm, *Heterodera rostochiensis* Woll. By J. H. Fidler. (With Plate and 2 Text-figures) 269

10. The behaviour of populations of potato-root eelworm (*Heterodera rostochiensis* Woll.) towards some resistant tuberous and other *Solanum* species. By F. G. W. Jones and Krystyna Pawelska. (With 2 Text-figures) . 277

11. The predaceous activity of nematode-trapping fungi added to soil. By Roderic C. Cooke 295

12. Populations of stem-boring Diptera in leys and in subsequent winter wheat and the effects of aldrin and phorate. By A. J. Heard and M. J. Hopper 301

13. The effect of restricted air supply on some insects which infest grain. By T. A. Oxley and Gloria Wickenden. (With Plate and 5 Text-figures) 313

14. Proceedings of the Association of Applied Biologists: Symposium on Harmful Mammals:

Introduction. By I. Thomas 325

The limitations of control measures. By Harry V. Thompson . 326

Spring traps and their development. By H. G. Lloyd . . . 329

Some aspects of grey squirrel control. By K. D. Taylor . . 334

Observations on the rabbit flea—a vector of myxomatosis. By A. R. Mead-Briggs 338

Keeping sewers free from rats. By E. W. Bentley, A. H. Bathard and L. E. Hammond 343

Social behaviour and movements of rats. By D. C. Drummond . 343

Feral coypus in Britain. By R. A. Davis 345

Population studies of the house-mouse. By F. P. Rowe . . . 348

Reviews 351

No. 3 (June 1963)

1. Crop protection in the tropics. (Presidential Address). By H. G. H. Kearns. (With Portrait) 353

2. A diffusion technique for assessing antifouling activity. By A. O. Christie and D. J. Crisp. (With Plate in colour and 2 Text-figures) . . 361

PAGE

3. Assessments of the infection of guineacorn (*Sorghum vulgare*) by covered smut (*Sphacelotheca sorghi* (Link) Clint.) in Northern Nigeria in 1957 and 1958. By K. M. Harris 367

4. Some graminicolous fungi associated with spotting of banana leaves in Jamaica. By D. S. Meredith. (With Plate and 1 Text-figure) . . . 371

5. The control of *Gloeosporium album* rot of stored apples by orchard sprays which reduce sporulation of wood infections. By R. T. Burchill and K. L. Edney. (With 4 Text-figures) 379

6. The effect of environment, and nutrition of pathogen and host, in the damping off of seedlings by *Rhizoctonia solani*. By M. C. Shephard and R. K. S. Wood. (With 1 Text-figure) 389

7. Withertip disease of limes (*Citrus aurantifolia*) in Zanzibar. II. Mercury residues on leaves and fruits. By B. E. J. Wheeler, J. A. Pickard and J. T. Martin. (With 1 Text-figure) 403

8. Withertip disease of limes (*Citrus aurantifolia*) in Zanzibar. III. The leaf cuticle in relation to infection by *Gloeosporium limetticola* Clausen. By M. F. Roberts and J. T. Martin 411

9. Further studies on the biological activity of bulbiformin. By R. S. Vasudeva, P. Singh, P. K. Sen Gupta, M. Mahmood and B. S. Bajaj. (With 4 Text-figures) 415

10. The uptake of copper by fungal cells. By E. Somers. (With 4 Text-figures) 425

11. Studies upon the copper fungicides. XII. Absorption of complexes by leaves. By P. Arman and R. L. Wain. (With 1 Text-figure) . . . 439

12. Investigations on fungicides. VIII. The fungicidal properties of some thiocarbamoylthionitroparaffins. By R. L. Wain, W. Sobótka and D. M. Spencer 445

13. Studies on plant growth-regulating substances. XVII. Chloromethylphenoxyacetic acids and chloromethylphenylglycines. By G. G. Clarke and R. L. Wain 453

14. Changes in the capsule of *Papaver somniferum* between flowering and maturity. By E. S. Bunting. (With 11 Text-figures) 459

15. Tomato seed germination and emergence at controlled soil-moisture tensions from 0·5 to 20 cm. mercury. By H. R. B. Hack. (With 5 Text-figures) 473

16. The translaminar effect of Kelthane on three strains of glasshouse red spider mite *Tetranychus urticae* Koch (*T. telarius* L.) on cucumbers. By V. A. Cooke 485

17. The effect of weather on emergence and take-off of overwintering *Limothrips cerealium* Haliday (Thysanoptera). By T. Lewis. (With 10 Text-figures) 489

PAGE

18. Control of seed-borne lucerne stem eelworm with phorate. By K. G. GOSTICK 503

Obituary. Professor William Broadhurst Brierley, D.Sc. 509

19. Proceedings of the Association of Applied Biologists: Symposium on effect of environment on crop production:

Introduction. By A. H. BUNTING 511

Seasonal fluctuations in yield estimations in cereals. By W. E. H. FIDDIAN. 513

Varietal response to water supply in wheat. By J. BINGHAM . . 515

The influence of disease on yield of sugar beet. By R. HULL. (With 1 Text-figure) 516

Implications of variety × environment interactions in grasses. By A. LAZENBY and H. H. ROGERS 518

Seasonal variation in yield and quality of cotton. By J. E. JACKSON 519

Year-to-year variation in yields of root vegetables from a long-term manurial experiment at Wellesbourne. By R. B. AUSTIN . . 523

Report of the Council of the Association of Applied Biologists for the year 1962 525

INDEX OF AUTHORS

PAGE

ARMAN, P. and WAIN, R. L. Studies upon the copper fungicides. XII. Absorption of copper complexes by leaves 439

AUSTIN, R. B. Year-to-year variation in yields of root vegetables from a long-term manurial experiment at Wellesbourne 523

BAJAJ, B. S. *See* VASUDEVA, R. S. *et al.* 415

BATES, ANGELA N., SPENCER, D. M. and WAIN, R. L. Investigations on fungicides. VII. The antifungal activity of certain hydroxy nitro alkanes and related compounds . . . 153

BATHARD, A. H. *See* BENTLEY, E. W. *et al.* 343

BENTLEY, E. W., BATHARD, A. H. and HAMMOND, L. E. Keeping sewers free from rats . . 343

BINGHAM, J. Varietal response to water supply in wheat 515

BLYTHE, W. Experimental moniliasis 170

BUNTING, A. H. The effect of environment on crop production: introduction 511

BUNTING, E. S. Changes in the capsule of *Papaver somniferum* between flowering and maturity 459

BURCHILL, R. T. and EDNEY, K. L. The control of *Gloeosporium album* rot of stored apples by orchard sprays which reduce sporulation of wood infections 379

BUXTON, E. W. and KENDRICK, J. B. A method of isolating *Pythium* spp. and *Fusarium oxysporum* from soil. (With plate) 215

BYFORD, W. J. Experiments on the use of ethyl mercury phosphate and other materials for treating sugar-beet seed 41

CABORN, J. M. Investigations of wind in the vicinity of shelterbelts and windbreaks . . 169

CARR, A. J. H. and STODDART, J. L. The ameliorating effect of zinc on symptoms of phyllody virus (strawberry green-petal) in white clover. (With plate) 259

CARTER, G. A., GARRAWAY, J. L., SPENCER, D. M. and WAIN, R. L. Investigations on fungicides. VI. The antifungal activity of certain dithiocarbamic and hydroxydithioformic acid derivatives 135

CHANNON, A. G. Studies in parsnip canker:

I. The causes of the diseases. (With 2 plates) 1

II. Observations on the occurrence of *Itersonilia pastinacae* and related fungi on the leaves of parsnips and in the air within parsnip crops 223

CHRISTIE, A. O. and CRISP, D. J. A diffusion technique for assessing antifouling activity. (With plate in colour) 361

CLARKE, G. G. and WAIN, R. L. Studies on plant growth-regulating substances. XVII. Chloromethylphenoxyacetic acids and chloromethylphenylglycines 453

COOKE, RODERIC. The predaceous activity of nematode-trapping fungi added to soil . . 295

COOKE, V. A. The translaminar effect of Kelthane on three strains of glasshouse red spider mite *Tetranychus urticae* Koch (*T. telarius* L.) on cucumbers 485

CRISP, D. J. *See* CHRISTIE, A. O. 361

DAVIS, R. A. Feral coypus in Britain 345

DIAS, H. F. Host range and properties of grapevine fanleaf and grapevine yellow mosaic viruses. (With plate) 85

DIAS, H. F. and HARRISON, B. D. The relationship between grapevine fanleaf, grapevine yellow mosaic and arabis mosaic viruses 97

DRUMMOND, D. C. Social behaviour and movements of rats 343

DUNCAN, C. J. The response of the feral pigeon when offered the active ingredients of commercial repellents in solution 127

PAGE

DUNN, E. Some ecological effects of temperature and cropping on population dynamics of *Heterodera rostochiensis* Woll. 172

EDNEY, K. L. *See* BURCHILL, R. T. 379

ELOJA, A. L. and TINSLEY, T. W. Abacá mosaic virus and its relationship to sugar-cane mosaic. (With plate) 253

ELLENBERGER, CHRISTINA E. *See* POSNETTE, A. F. 69

FIDDIAN, W. E. H. Seasonal fluctuations in yield estimation in cereals 513

FIDLER, J. H. Some new equipment for routine assessment of levels of soil infestation by the potato-root eelworm *Heterodera rostochiensis* Woll. (With plate) 269

FRICK, E. L. *See* KIRBY, A. H. M. 51, 61

GARRAWAY, J. L. *See* CARTER, G. A. *et al.* 135

GENTLES, J. C. Some aspects of ringworm 170

GLYNNE, MARY D. Eyespot (*Cercosporella herpotrichoides*) and other factors influencing yield of wheat in the six-course rotation experiment at Rothamsted (1930–60) 189

GOSTICK, K. G. Control of seed-borne lucerne stem eelworm with phorate 503

GRIFFITHS, D. A. and ISAAC, IVOR. Reactions of tomato leaves to species of *Verticillium* . . 231

HACK, H. R. B. Tomato seed germination and emergence at controlled soil-moisture tensions from 0·5 to 20 cm. mercury 473

HAMMOND, L. E. *See* BENTLEY, E. W. *et al.* 343

HARRIS, K. M. Assessments of the infection of guineacorn (*Sorghum vulgare*) by covered smut (*Sphacelotheca sorghii* (Link) Clint.) in Northern Nigeria in 1957 and 1958 . . . 367

HARRISON, B. D. *See* DIAS, H. F. 97

HEARD, A. J. and HOPPER, M. J. Populations of stem-boring Diptera in leys and in subsequent winter wheat and the effects of aldrin and phorate 301

HOPPER, M. J. *See* HEARD, A. J. 301

HULL, R. The influence of disease on yield of sugar beet 516

ISAAC, IVOR. *See* GRIFFITHS, D. A. 231

JACKSON, J. E. Seasonal variation in yield and quality of cotton 519

JONES, F. G. W. and PAWELSKA, KRYSTYNA. The behaviour of populations of potato-root eelworm (*Heterodera rostochiensis* Woll.) towards some resistant tuberous and other *Solanum* species 277

KEARNS, H. G. H. Crop protection in the tropics (Presidential address). (With portrait) . 353

KENDRICK, J. B. *See* BUXTON, E. W. 215

KIRBY, A. H. M. and FRICK, E. L. Greenhouse evaluation of chemicals for control of powdery mildews:

I. A method suitable for apple and barley 51

II. Some factors affecting artificial infection of apple foliage 61

LAPWOOD, D. H. Potato haulm resistance to *Phytophthora infestans*. IV. Laboratory and field estimates compared, and further field analyses 17

LAZENBY, A. and ROGERS, H. H. Implications of variety × environment interactions in grasses 518

LEWIS, T. The effect of weather on emergence and flight of overwintering *Limothrips cerealium* Haliday (Thysanoptera) 489

LLOYD, H. G. Spring traps and their development 329

PAGE

MAHMOOD, M. *See* VASUDEVA, R. S. *et al.* 415

MARTIN, J. T. *See* ROBERTS, MARGARET F. 411

MARTIN, J. T. *See* WHEELER, B. E. J. *et al.* 403

MEAD-BRIGGS, A. R. Observations on the rabbit flea—a vector of myxomatosis . . . 338

MEREDITH, D. S. 'Eyespot', a foliar disease of bananas caused by *Drechslera gigantea* (Heald & Wolf) Ito. I. Preliminary studies on pathogenicity and spore dispersal. (With plate) . 29

MEREDITH, D. S. Some graminicolous fungi associated with spotting of banana leaves in Jamaica 371

NEWBOLD, J. W. The economics and chemical control of timothy flies (*Amaurosoma* spp.) . 171

OSBORNE, P. The life history, development and parasites of *Meligethes aeneus* (F.) . . . 172

OXLEY, T. A. and WICKENDEN, GLORIA. The effect of restricted air supply on some insects which infest grain. (With plate) 313

PAWELSKA, KRYSTYNA. *See* JONES, F. G. W. 277

PICKARD, J. A. *See* WHEELER, B. E. J. *et al.* 403

POSNETTE, A. F. and ELLENBERGER, CHRISTINA E. Further studies of green petal and other leafhopper-transmitted viruses infecting strawberry and clover. (With 2 plates) . . 69

PURVES, D. *See* RAGG, J. M. 169

RAGG, J. M. and PURVES, D. Copper deficiency problems in south-east Scotland . . . 169

ROBERTS, MARGARET F. and MARTIN, J. T. Withertip disease of limes (*Citrus aurantifolia*) in Zanzibar. III. The leaf cuticle in relation to infection by *Gloeosporium limetticola* Clausen 411

ROGERS, H. H. *See* LAZENBY, A. 518

ROTHWELL, K. and WAIN, R. L. Studies on plant growth-regulating substances. XVII. S-esters of dithiocarbamates derived from amino acids 161

ROWE, F. P. Population studies of the house-mouse 348

SEN GUPTA, P. K. *See* VASUDEVA, R. S. *et al.* 415

SHEPHARD, M. C. and WOOD, R. K. S. The effect of environment, and nutrition of parasite and host, in the damping-off of seedlings of *Rhizoctonia solani* 389

SOBÓTKA, W. *See* WAIN, R. L. *et al.* 445

SINGH, P. *See* VASUDEVA, R. S. *et al.* 415

SOMERS, E. The uptake of copper by fungal cells 425

SPENCER, D. M. *See* BATES, ANGELA N. *et al.* 153

SPENCER, D. M. *See* CARTER, G. A. *et al.* 135

SPENCER, D. M. *See* WAIN, R. L. *et al.* 445

STODDART, J. L. *See* CARR, A. J. H. 259

STOUGHTON, R. H. Obituary notice: W. B. BRIERLEY 509

TAYLOR, K. D. Some aspects of grey squirrel control 334

THOMAS, I. Harmful mammals: introduction 325

THOMPSON, HARRY V. The limitations of control measures 326

TINSLEY, T. W. *See* ELOJA, A. L. 253

VASUDEVA, R. S., SINGH, P., SEN GUPTA, P. K., MAHMOOD, M. and BAJAJ, B. S. Further studies on the biological activity of bulbiformin 415

WAIN, R. L., SOBÓTKA, W. and SPENCER, D. M. Investigations on fungicides. VIII. The fungicidal properties of some thiocarbamoylthionitroparaffins 445

PAGE

WAIN, R. L. *See* ARMAN, P. 439

WAIN, R. L. *See* BATES, ANGELA N. *et al.* 153

WAIN, R. L. *See* CARTER, G. A. *et al.* 135

WAIN, R. L. *See* CLARKE, G. G. 453

WAIN, R. L. *See* ROTHWELL, K. 161

WAKERLEY, S. B. Effect of lime and phosphate on soil Collembola 171

WELBANK, P. J. A comparison of competitive effects of some common weed species . . 107

WHEELER, B. E. J. Withertip disease of limes (*Citrus aurantifolia*) in Zanzibar. I. Field trials with fungicides 237

WHEELER, B. E. J., PICKARD, J. A. and MARTIN, J. T. Withertip disease of limes (*Citrus aurantifolia*) in Zanzibar. II. Mercury residues on leaves and fruits 403

WICKENDEN, GLORIA. *See* OXLEY, T. A. 313

WILLIAMS, C. B. Relation of weather conditions to insect activity and abundance in the Scottish Highlands 173

WILSON, A. R. Some observations on the infection of tomato stems by *Botrytis cinerea* Fr. 171

WOOD, R. K. S. Teaching and research in plant pathology (Barnes Memorial Lecture) . . 177

WOOD, R. K. S. *See* SHEPHARD, M. C. 389